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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/938,399	08/23/2001	Michael Barnes	A4944/139900	9940
32588	7590	06/17/2004	EXAMINER	
APPLIED MATERIALS, INC. 2881 SCOTT BLVD. M/S 2061 SANTA CLARA, CA 95050			MOORE, KARLA A	
			ART UNIT	PAPER NUMBER

1763

DATE MAILED: 06/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

AS

Office Action Summary**Application No.**

09/938,399

Applicant(s)

BARNES ET AL.

Examiner

Karla Moore

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 March 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,5-15 and 24-33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,5-15,24,25,27,30 and 33 is/are rejected.
- 7) ☒ Claim(s) 26,28,29,31 and 32 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claim 27 is rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,342,275 to Bartholomew et al.
3. Bartholomew et al. disclose an apparatus comprising: a first atmospheric deposition station (Figure 2, "CHAMBER 1") capable of comprising a first material capable of forming a first dielectric layer on a semiconductor substrate (column 1, rows 20-34); a second atmospheric deposition station (Figure 2, "CHAMBER 2") comprising an atmospheric pressure vapor deposition station and capable of comprising a second material capable of forming a second dielectric layer on the semiconductor substrate (Figure 2, "CHAMBER 1"), wherein the first atmospheric deposition station, and the second atmospheric station are coupled together (by buffer modules, 38); and a substrate handling system (39) adapted to transfer the substrate into and out of the first atmospheric deposition station and the second atmospheric deposition station, and wherein a plasma system is associated with the atmospheric vapor deposition station, and wherein all the processing stations in the apparatus are at atmospheric pressure and not vacuum pumps are present in the apparatus. Regarding the use of plasma system, Bartholomew et al. clearly disclose that it is known in the art to provide plasma in semiconductor manufacturing deposition processes (column 1, row 28).

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Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1, 3, 6-10 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,451,118 to Garriga in view of U.S. Patent No. 6,342,275 to Miyakawa et al.

6. Garriga discloses an apparatus capable of forming a first dielectric layer and a second layer on a semiconductor substrate in Figure 5 substantially as claimed, the apparatus comprising: a first atmospheric deposition station (552; column 6, rows 48-54) capable of accommodating a first material for forming a first dielectric layer on a semiconductor substrate; a second atmospheric deposition station (556) comprising an atmospheric pressure vapor deposition chamber (column 5, rows 45-49 and column 6, rows 34-38) and capable of accommodating a second material for forming a second layer on a semiconductor substrate, wherein the first atmospheric station and the second atmospheric deposition station are coupled together; and a substrate handling system (516 and 518) adapted to transfer the substrate into and out of the first atmospheric deposition station and the second atmospheric deposition station. Examiner has arbitrarily picked numbers for the processing chambers above from the chambers illustrated in Figure 5a, as Garriga teaches that any of the chambers may be constructed to perform the processes set forth in the disclosure. The apparatus of Garriga is suitable for use in manufacturing semiconductors (column 3, row 65 through column 4, rows 1).

7. However, Garriga fails to teach a plasma system associated with the atmospheric deposition chamber.

8. Miyakawa et al. teach the use of an atmospheric deposition apparatus comprising a plasma system supplying an active gas for the purpose of forming a film with various desirable

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properties, such as water repellency, hydrophilic properties or high hardness (abstract). The apparatus of Miyakawa et al. is suitable for use in manufacturing semiconductors (column 1, rows 16-19).

9. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided an atmospheric deposition apparatus comprising a plasma system supplying an active gas in Garriga in order to form a film with various desirable properties, such as water repellency, hydrophilic properties or high hardness as taught by Miyakawa et al.

10. With respect to claim 3, any of the four atmospheric deposition stations may be configured to comprise an ultrasonic spray deposition device (column 5, rows 55-57).

11. With respect to claim 6, any of the processing stations (atmospheric or vacuum) could be used as a curing station (column 5, rows 50-54 and column 6, rows 5-6). Although the "curing station" is described as a "heating" station by Garriga, it can also be considered to be a curing chamber, where "cure" is defined by Merriam-Webster as "to prepare or alter especially by chemical or physical processing for keeping or use".

12. With respect to claims 7 and 8, the courts have ruled that expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim. Ex parte Thibault, 164 USPQ 666, 667 (Bd. App. 1969).

13. With respect to claim 9, the atmospheric vapor deposition chamber is an atmospheric chemical vapor deposition chamber (column 5, rows 45-49).

14. With respect to claim 10, though not explicitly disclosed, the first atmospheric deposition station would inherently comprise a liquid dispenser for any liquid treatment to be performed on the substrate (column 5, rows 40-44 and column 5, rows 29-33).

15. With respect to claim 33, the courts have ruled that a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). The courts have also ruled that expressions relating the apparatus to contents thereof

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during an intended operation are of no significance in determining patentability of the apparatus claim. Ex parte Thibault, 164 USPQ 666, 667 (Bd. App. 1969).

16. Claims 2 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garriga and Miyakawa et al. as applied to claims 1, 3 and 6-10 above, and further in view of U.S. Patent No. 5,562,772 to Neoh.

17. Garriga and Miyakawa et al. disclose the invention substantially as claimed and as described above. Garriga further discloses the apparatus comprising: an annealing chamber (554), a silylation chamber (550) and a curing chamber (any one of 520, 522, 524 or 526).

18. However, Garriga and Miyakawa et al. fail to teach the first atmospheric deposition station housing a spin coater.

19. Neoh teaches the use of a spin coater for the purpose of forming a coating layer that has uniform thickness and is substantially free of bubbles (column 1, rows 60-64).

20. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to provided a spin coater in the atmospheric deposition chamber in Garriga and Miyakawa et al. in order to form a coating layer that has uniform thickness and is substantially free of bubbles as taught by Neoh.

21. Claims 5 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garriga and Miyakawa et al. as applied to claims 1, 3 and 6-10 above, and further in view of U.S. Patent No. 5,337,362 to Imahashi.

22. Garriga and Miyakawa et al. disclose the invention substantially as claimed and as described above.

23. However, the Garriga and Miyakawa et al. fail to teach a remote plasma system adapted to generate a plasma upstream of the atmospheric chemical vapor deposition chamber.

24. Imahashi et al. teach the use of a remote plasma system associated with a deposition chamber in a multiple chamber system for the purpose of preventing ions from being supplied to

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the deposition chamber and causing damage to a substrate (column 2, rows 42-47 and column 6, rows 14-34).

25. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a remote plasma system in Garriga and Miyakawa et al. in order to prevent ions from being supplied to a deposition chamber and causing damage to a substrate as taught by Imahashi et al.

26. Claims 11, 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,451,118 to Garriga in view of U.S. Patent No. 6,342,275 to Miyakawa et al. and U.S. Patent No. 5,562,772 to Neoh.

27. Garriga discloses the invention substantially as claimed and comprising: an apparatus capable of forming a first porous dielectric layer and a second layer on a semiconductor substrate in Figure 5 substantially as claimed, the apparatus comprising: an atmospheric chemical vapor deposition chamber (556); a coating chamber (552) coupled to the atmospheric chemical vapor deposition chamber; a curing station (any one of 520, 522, 524 or 526) coupled to the atmospheric chemical vapor deposition chamber; and a substrate handling system (516 and 518) adapted to transfer substrates between the atmospheric chemical vapor deposition chamber, the coating chamber and the curing station. The apparatus of Garriga is suitable for use in manufacturing semiconductors (column 3, row 65 through column 4, rows 1).

28. However, Garriga fails to teach a plasma system associated with the atmospheric deposition chamber.

29. Miyakawa et al. teach the use of an atmospheric deposition apparatus comprising a plasma system supplying an active gas for the purpose of forming a film with various desirable properties, such as water repellency, hydrophilic properties or high hardness (abstract). The apparatus of Miyakawa et al. is suitable for use in manufacturing semiconductors (column 1, rows 16-19).

30. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided an atmospheric deposition apparatus comprising a plasma

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system supplying an active gas in Garriga in order to form a film with various desirable properties, such as water repellency, hydrophilic properties or high hardness as taught by Miyakawa et al.

31. Garriga and Miyakawa et al. disclose the invention substantially as claimed and as described above.

32. However, Garriga and Miyakawa et al. fail to teach the coating station housing a spin coater.

33. Neoh teaches the use of a spin coater for the purpose of forming a coating layer that has uniform thickness and is substantially free of bubbles (column 1, rows 60-64).

34. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to provided a spin coater in the atmospheric deposition chamber in Garriga and Miyakawa et al. in order to form a coating layer that has uniform thickness and is substantially free of bubbles as taught by Neoh.

35. With respect to the recitations drawn to the material used during an intended use of the apparatus, the courts have ruled expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim. Ex parte Thibault, 164 USPQ 666, 667 (Bd. App. 1969).

36. With respect to claim 13, the substrate handling system comprises a plurality of substrate handlers (516 and 518) with arms.

37. With respect to claim 14 and 15, the apparatus is a cluster tool (abstract).

38. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Garriga, Miyakawa et al. and Neoh as applied to claims 11 and 13-15 above, and further in view of U.S. Patent No. 5,337,362 to Imahashi.

39. Garriga, Miyakawa et al. and Neoh disclose the invention substantially as claimed and as described above.

40. However, Garriga, Miyakawa et al. and Neoh fail to teach a remote plasma system adapted to generate a plasma upstream of the atmospheric chemical vapor deposition chamber.

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41. Imahashi et al. teach the use of a remote plasma system associated with a deposition chamber in a multiple chamber system for the purpose of preventing ions from being supplied to the deposition chamber and causing damage to a substrate (column 2, rows 42-47 and column 6, rows 14-34).

42. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a remote plasma system in Garriga, Miyakawa et al. and Neoh in order to prevent ions from being supplied to a deposition chamber and causing damage to a substrate as taught by Imahashi et al.

43. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bartholomew et al. as applied to claim 27 above, in view of U.S. Patent No. 5,337,362 to Imahashi.

44. Bartholomew et al. disclose the invention substantially as claimed and as described above.

45. However, Bartholomew et al. fail to teach a remote plasma system adapted to generate a plasma upstream of the atmospheric chemical vapor deposition chamber.

46. Imahashi et al. teach the use of a remote plasma system associated with a deposition chamber in a multiple chamber system for the purpose of preventing ions from being supplied to the deposition chamber and causing damage to a substrate (column 2, rows 42-47 and column 6, rows 14-34).

47. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a remote plasma system in Bartholomew et al. in order to prevent ions from being supplied to a deposition chamber and causing damage to a substrate as taught by Imahashi et al.

Allowable Subject Matter

48. Claims 26, 28-29 and 31-32 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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49. The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record fails to fairly teach or suggest an apparatus capable of forming a first porous dielectric layer and a second capping layer on a semiconductor substrate, the apparatus comprising: atmospheric chemical vapor deposition chamber; a plasma system associated with the atmospheric deposition chamber; **a spin coating chamber coupled to the atmospheric chemical vapor deposition chamber; a curing station coupled to the atmospheric chemical vapor deposition chamber;** and a substrate handling system adapted to transfer substrates between the atmospheric chemical vapor deposition chamber, the spin coating chamber and the curing station, wherein the spin coating chamber comprises a first material comprising a sol-gel solution used to form the first porous dielectric layer and wherein the atmospheric chemical vapor deposition chamber comprises a second material used to form the second capping layer, and wherein the curing chamber is capable of curing the sol-gel solution to form the first porous dielectric layer; **and wherein all processing stations are at atmospheric pressure and no vacuum pumps are present in the apparatus.** The closest piece of prior art is Bartholomew et al., which teaches an all atmospheric pressure apparatus; however, this reference fails to teach the apparatus comprising a spin coating chamber and/or a curing chamber or any sort of chamber where the processing fluid could be anything other than a gas. For the same reason, claims 28-29 and 31-32 are allowable. Claims 29 and 32 are allowable because they implicitly require deposition means, other than gas depositing means. See below regarding the method/intended use/apparatus contents limitations recited in these claims.

Response to Arguments

50. With respect to Applicant's arguments regarding claims containing recitations drawn to contents of the apparatus during an intended operation, the courts have ruled that expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim. Ex parte Thibault, 164 USPQ 666, 667 (Bd. App. 1969). Similar to recitations regarding intended use, the apparatus must only be capable of using the claimed contents.

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51. With respect to Applicants arguments that the Garriga does not teach or suggest deposition processes, Examiner disagrees. As noted in the previous office action, Garriga discloses at column 3, rows 62 through column 4, rows 1, that the main feature of the invention is that the apparatus is capable of providing "any known semiconductor process". One of ordinary skill in the art would clearly recognize that this includes deposition processes. Also, in the discussion of the background art, Garriga also contemplates the use of multi-chamber apparatus containing deposition and/or etch processes. It is indisputably well known in the art that multi-chamber apparatus may contain chambers for addition processes, such as deposition, or subtraction processes, such as etching. Further, at column 3, rows 36-42, Garriga states that the apparatus can comprise "atmospheric-compatible or chemical process steps". Again, this would indicate to one of ordinary skill in that the apparatus is capable of deposition processes, as clearly deposition is included in this definition. Examiner recognizes that the disclosure fails to explicitly state that the apparatus is capable of deposition processes. However, the processes explicitly mentioned in the disclosure and Applicants Remarks (i.e. etching and rinsing) are clearly disclosed as non-limiting examples and one of ordinary skill in the art would recognize that as structurally disclosed in column 5, rows 33-57 the chamber would be capable of deposition, as well.

52. Arguments with respect to the newly added claims are not addressed here as they are directed to art that was not used in the rejection of these claims.

53. With regard to Applicant's arguments regarding the use of the Miyakawa et al. reference, Examiner notes that while hardness may not be the best example to apply to the currently claimed invention, it was in fact--*an example*. Miyakawa et al. teach that the use of plasma may be used to Others were given in the action for instance producing a water repellant film or a hydrophilic film, which could be relevant to semiconductor technology and also, depending on the type of film to be formed the speed of polymerization can be controlled or adhesion can be utilized to improve film properties.

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Conclusion

54. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karla Moore whose telephone number is 571.272.1440. The examiner can normally be reached on Monday-Friday, 8:30am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on 571.272.1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

km
9 June 2004


Parviz Hassanzadeh
Primary Examiner
Art Unit 1763